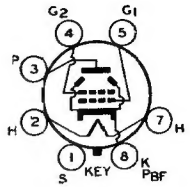
RCA-6L6

BEAM POWER AMPLIFIER



The 6L6 is a power-amplifier tube of the All-Metal type for use in the output stage of radio receivers, especially those designed to have ample reserve of power-delivering ability. The 6L6 provides high power output sensitivity and high efficiency. The power output at all levels has low third and negligible higher-order harmonic distortion. When operated at maximum ratings, this tube will give over 11 watts output in single-ended operation and as much as 60 watts in push-pull. When the push-pull connection is used with a 6600-ohm load, the 6L6 will give 34 watts of audio power without the need of grid-driving power. For discussion of beam power amplifier considerations, refer to page 10.

CHARACTERISTICS

Heater Voltage (A. C. or D. C.)	6.3	Volts
Heater Current	0.9	Ampere
Average Characteristics		
Plate Voltage	250	Volts
Screen Voltage	250	Volts
Grid Voltage	−14	Volts
Plate Current	72	Milliamperes
Screen Current	5	Milliamperes
Plate Resistance	22500	Ohms
Amplification Factor	135	
Transconductance	6000	Micromhos
Base	Small Wafer Octal 7-Pin	

As Single-Tube Class A_1 Amplifier—With Self-bias

Plate Voltage			375 *max.*	Volts
Screen Voltage			250 *max.*	Volts
Screen Dissipation			3.5 *max.*	Watts
Plate and Screen Dissipation			24 *max.*	Watts
Typical Operation				
Plate Voltage	375	250	300	Volts
Screen Voltage	125	250	200	Volts
Self-Bias Resistor	365	170	220	Ohms
Peak A-F Grid Voltage	8.5	14	12.5	Volts
Zero-Signal Plate Current	24	75	51	Milliamperes
Max.-Signal Plate Current	24.3	78	54.5	Milliamperes
Zero-Signal Screen Current	0.7	5.4	3	Milliamperes
Max.-Signal Screen Current	1.8	7.2	4.6	Milliamperes
Load Resistance	14000	2500	4500	Ohms
Total Harmonic Distortion	9	10	11	Per cent
Second Harmonic Distortion	8	9.7	10.7	Per cent
Third Harmonic Distortion	4	2.5	2.5	Per cent
Max.-Signal Power Output	4	6.5	6.5	Watts

As Single-Tube Class A_1 Amplifier—Fixed Bias

Plate Voltage	375 *max.*	Volts
Screen Voltage	250 *max.*	Volts
Screen Dissipation	3.5 *max.*	Watts
Plate and Screen Dissipation (Total)	24 *max.*	Volts

Typical Operation					
Plate Voltage	375	250	300	375	Volts
Screen Voltage	125	250	200	250	Volts
D-C Grid Voltage	−9	−14	−12.5	−17.5	Volts
Peak A-F Grid Voltage	8	14	12.5	17.5	Volts
Zero-Signal Plate Current	24	72	48	57	Milliamperes
Max.-Signal Plate Current	26	79	55	67	Milliamperes
Zero-Signal Screen Current	0.7	5	2.5	2.5	Milliamperes
Max.-Signal Screen Current	2	7.3	4.7	6	Milliamperes
Load Resistance	14000	2500	4500	4000	Ohms
Total Harmonic Distortion	9	10	11	14.5	Per cent
Second Harmonic Distortion	8	9.7	10.7	11.5	Per cent
Third Harmonic Distortion	4	2.5	2.5	4.2	Per cent
Max.-Signal Power Output	4.2	6.5	6.5	11.5	Watts

As Push-Pull Class A_1 Amplifier

Plate Voltage	375 *max.*	Volts
Screen Voltage	250 *max.*	Volts
Screen Dissipation	3.5 *max.*	Watts
Plate and Screen Dissipation (Total)	24 *max.*	Watts

Typical Operation *Values are for two tubes.*

	Fixed Bias	*Self-Bias*	
Plate Voltage	250	250	Volts
Screen Voltage	250	250	Volts
D-C Grid Voltage	−16	—	Volts
Self-Bias Resistor	—	125	Ohms
Peak A-F Grid-to-Grid Voltage	32	35.6	Volts
Zero-Signal Plate Current	120	120	Milliamperes
Max.-Signal Plate Current	140	130	Milliamperes
Zero-Signal Screen Current	10	10	Milliamperes
Max.-Signal Screen Current	16	15	Milliamperes
Load Resistance (Plate-to-plate)	5000	5000	Ohms
Total Harmonic Distortion	2	2	Per cent
Third Harmonic Distortion	2	2	Per cent
Max.-Signal Power Output	14.5	13.8	Watts

As Push-Pull Class AB_1 Amplifier

Plate Voltage	400 *max.*	Volts
Screen Voltage	300 *max.*	Volts
Screen Dissipation	3.5 *max.*	Watts
Plate and Screen Dissipation (Total)	24 *max.*	Watts

Typical Operation *Values are for two tubes.*

	Self-Bias		*Fixed Bias*		
Plate Voltage	400	400	400	400	Volts
Screen Voltage	250	300	250	300	Volts
D-C Grid Voltage	—	—	−20	−25	Volts
Self-Bias Resistor	190	200	—	—	Ohms
Peak A-F Grid-to-Grid Volt.	43.8	57	40	50	Volts
Zero-Signal Plate Current	96	112	88	102	Milliamperes
Max.-Signal Plate Current	110	128	124	152	Milliamperes
Zero-Signal Screen Current	4.6	7	4	6	Milliamperes
Max.-Signal Screen Current	10.8	16	12	17	Milliamperes
Load Resist. (Plate-to-plate)	8500	6600	8500	6600	Ohms
Total Harmonic Distortion	2	2	2	2	Per cent
Third Harmonic Distortion	2	2	2	2	Per cent
Max.-Signal Power Output	24	32	26.5	34	Watts

As Push-Pull Class AB_2 Amplifier—Fixed Bias

Plate Voltage	400 *max.*	Volts

SCREEN VOLTAGE		300 *max.*	Volts
SCREEN DISSIPATION		3.5 *max.*	Watts
PLATE AND SCREEN DISSIPATION (Total)		24 *max.*	Watts
TYPICAL OPERATION *Values are for two tubes.*			
Plate Voltage	400	400	Volts
Screen Voltage	250	300	Volts
D-C Grid Voltage	−20	−25	Volts
Peak A-F Grid-to-Grid Voltage	57	80	Volts
Zero-Signal Plate Current	88	102	Milliamperes
Max.-Signal Plate Current	168	230	Milliamperes
Zero-Signal Screen Current	4	6	Milliamperes
Max.-Signal Screen Current	13	20	Milliamperes
Load Resistance (Plate-to-plate)	6000	3800	Ohms
Peak Grid-Input Power†	0.18	0.35	Watt
Max.-Signal Power Output*	40	60	Watts

* With zero-impedance driver and perfect regulation, plate-circuit distortion does not exceed 2%. In practice, plate-voltage regulation, screen-voltage regulation, and grid-bias regulation, should not be greater than 5%, 5%, and 3%, respectively.

† Driver stage should be capable of supplying the grids of the Class AB stage with the specified peak values at low distortion. The effective resistance per grid circuit of the Class AB stage should be kept below 500 ohms and the effective impedance at the highest desired response frequency should not exceed 700 ohms.

INSTALLATION

The **base** pins of the 6L6 fit the standard octal socket which may be installed to hold the tube in any position.

The **heater** is designed to operate at 6.3 volts. The transformer supplying this voltage should be designed to operate the heater at this recommended value for full-load operating conditions at average line voltage. Under the maximum screen and plate dissipation conditions, the heater voltage should never fluctuate so that it exceeds 7.0 volts. For **cathode** connection, refer to type 6A8.

In all services precautions should be taken to insure that the dissipation rating is not exceeded with expected line-voltage variations, especially in the cases of fixed-bias operation. When the push-pull connection is used, fixed-bias values up to 10% of each typical screen voltage can be used without increasing distortion.

APPLICATION

As a **Class A_1 power amplifier**, the 6L6 should be operated as shown under CHARACTERISTICS. The values cover self- and fixed-bias operation and have been determined on the basis that no grid current flows during any part of the input signal swing. The second harmonics can easily be eliminated by the use of push-pull circuits. In single-tube, resistance-coupled circuits, the second-harmonics can be minimized by generating out-of-phase second harmonics in the pre-amplifier.

As a **push-pull Class AB_1 power amplifier**, the 6L6 may be operated as shown under CHARACTERISTICS. The values shown cover self- and fixed-bias operation and have been determined on the basis that no grid current flows during any part of the input signal swing.

The type of **input coupling** used in Class A_1 and Class AB_1 service should not introduce too much resistance in the grid-circuit. Transformer- or impedance-coupling devices are recommended. When the grid circuit has a resistance not higher than 0.1 megohm fixed-bias may be used; for higher values, self-bias is required. With self-bias, the grid circuit may have a resistance as high as, but not greater than, 0.5 megohm provided the heater voltage is not allowed to rise more than 10% above the rated value under any condition of operation.

As a **push-pull Class AB_2 power amplifier**, the 6L6 may be operated as shown under CHARACTERISTICS. The values cover operation with fixed-bias and have been determined on the basis that some grid current flows during the most positive swing of the input signal.

Refer to Circuit Section for circuits employing the 6L6, and to page 21 for discussion of inverse-feedback arrangements. A family of plate characteristics curves is given on page 96.